City of Somerville
Cities for Climate Protection Campaign

Greenhouse Gas Emissions Inventory Report

Including Recommendations for the Emissions Reduction Plan

Summer, 2001

Prepared by: Kristin Marcell
Somerville Environmental Coordinator's Office &
the International Council on Local Environmental Initiatives

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The International Council for Local Environmental Initiatives

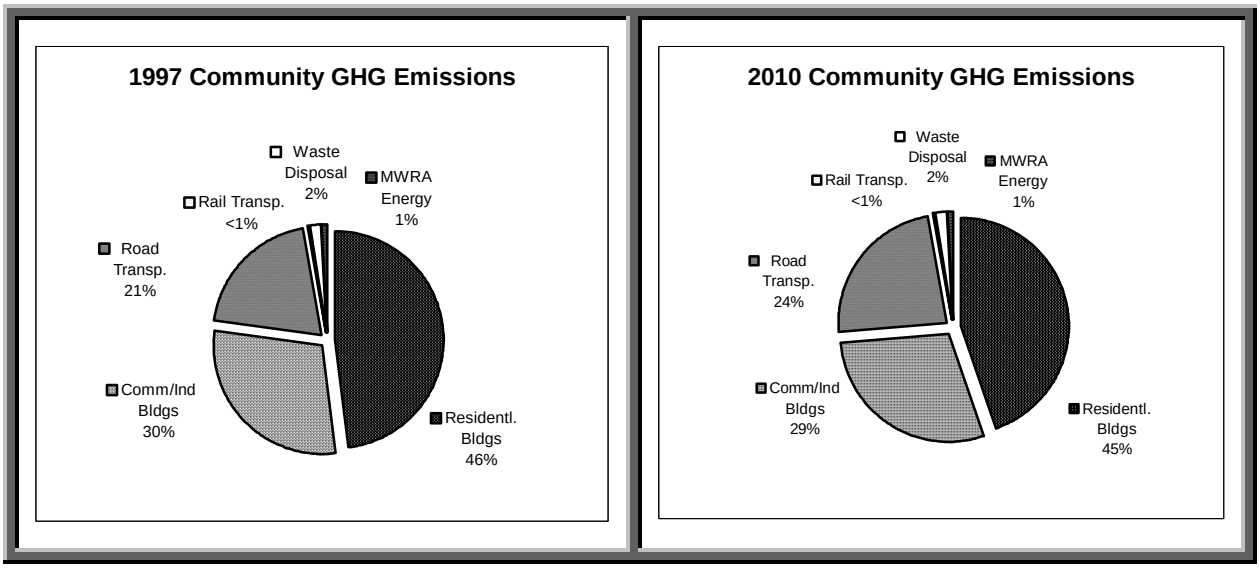
Executive Summary

Greenhouse gas emissions inventories were conducted for the City of Somerville at both the municipal operations level (Base year FY1999) and the community level (Base year 1997). Base years were chosen as the earliest years for which a significant amount of accurate data was available. The forecast year for both inventories was 2010. Data on transportation, energy use, and solid waste production were gathered from a variety of sources including municipal departments, local utilities, and state and federal agencies. This data was entered into software provided by the International Council for Local Environmental Initiatives (ICLEI) to compute total community and municipal greenhouse gas emissions (as eCO_2 or Carbon Dioxide equivalent) in Somerville.

Community Inventory Results:

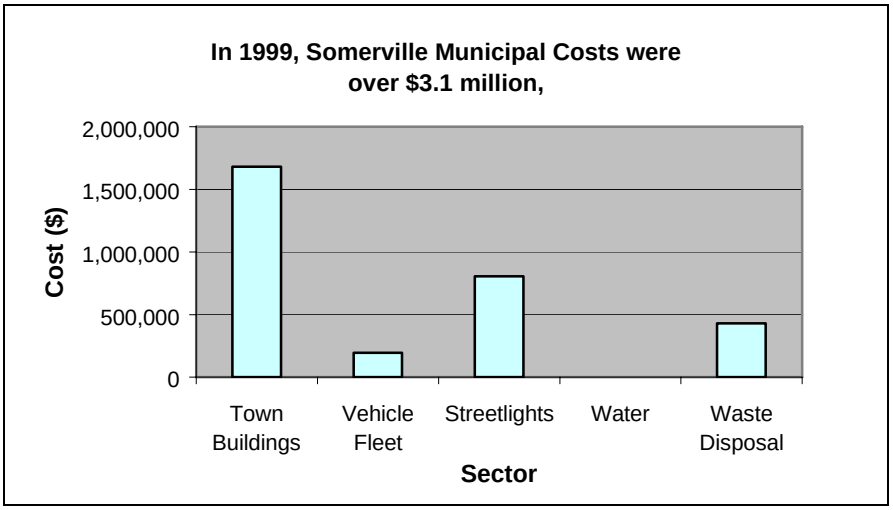
In 1997 the Somerville community used 7.7 million Btu's of energy producing 734,762 tons of eCO_2. This amounts to **9.5 tons eCO_2 /person/year**. By comparison, in that same year, Arlington produced 335,063 tons of eCO_2 (7.6 tons/ person/year), and in 1995 Medford produced 696,112 tons of eCO_2 (12.1 tons/person/year). The greatest amount of energy use and greenhouse gas emissions in the community result from the heating, cooling, and lighting of residential, commercial, and municipal buildings. Community greenhouse gas emissions may be expected to increase by 27,000 tons of eCO_2 or 3.7% by 2010 if no action is taken to reduce emissions.

Community Greenhouse Gas Emissions by Sector



Municipal Operations Inventory Results:

In 1999 the Somerville city government spent over $3.1 million on energy use related to buildings and operations producing 20,525 tons of eCO_2 emissions. The majority of municipal emissions came from building energy use. The City buildings that produced the greatest overall emissions include Somerville High School, the Powderhouse Community School, and the Lincoln Park School. Per square foot energy costs were highest in the Central Fire Station ($4.20), Lincoln Park School ($2.03), and the Healey School ($1.56). Municipal eCO_2 emissions make up roughly 3% of total community emissions. Municipal emissions in 2010 are forecasted to be 4.3% higher largely due to the energy use of the new Edgerly School.



THE NEXT STEPS

The city should decide on an emissions reduction target for 2010 and start putting together a Local Action Plan of initiatives to achieve this goal. The Local Action Plan should include new ways to reduce emissions such as:

- ►Monitoring energy use
- ►Using energy-saving technologies
- ►Creating energy-efficiency policies
- ►Incentives to reduce personal vehicle travel
- ►Transitioning to more fuel-efficient vehicles
- ►Retrofitting building heating systems
- ►Public education and outreach
- ►Encouraging Sustainable Development

Introduction

There is a scientific consensus that increased levels of "greenhouse gases," primarily carbon dioxide (CO_2) and methane (CH_4), in the earth's atmosphere are having a measurable effect on the earth's climate. Scientists generally believe that human consumption of fossil fuels and emissions from solid waste landfills are the primary reasons for the increased concentrations of these gases in the atmosphere. While the precise impacts are difficult to predict, the international scientific and political community now recognize that changes in the earth's climate will eventually alter weather patterns, ocean behavior, and biological processes if action is not taken soon. Climate change has the potential to expose Somerville residents to the risks posed by elevated summer temperatures, increased flooding, a greater number of severe weather events, loss of urban natural habitat, threats to water quality, and negative impacts on New England's natural resources.

***GREENHOUSE GASES*: CO2, METHANE**

***PRIMARY SOURCES*: ENERGY USED FOR HEATING, COOLING, LIGHTING, AND TRANSPORTATION AND THE DECOMPOSITION OF SOLID WASTE**

In January 2001, the City of Somerville passed a mayoral resolution to join the Cities for Climate Protection Campaign Program (CCP), a project of the International Council on Local Environmental Initiatives (ICLEI)*. This resolution recognized the need to address the global warming problem swiftly and effectively, and the City's unique position to play a role. Reducing greenhouse gas emissions not only helps to slow global warming, it also results in operating cost reductions and improvements in local air quality and public health. Over 100 local governments in the U.S., and over 400 around the world, have joined the Cities for Climate Protection Campaign to reduce their contribution to the global warming problem. They are finding their opportunities and benefits to be real and substantive.

The greenhouse gas emissions inventory is the first milestone in the campaign. It is meant to serve as a tool to reach the other milestones such as choosing the emissions reductions target and developing and implementing a Local Action Plan. Inventory results will give Somerville a clearer picture of the quantities and sources of its greenhouse gas emissions. This will help the City to choose an adequate emissions reduction target, prioritize emissions concerns, and develop effective initiatives that reduce Somerville's energy use costs and greenhouse gas emissons.

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* *The International Council for Local Environmental Initiatives works with local governments from around the world on local sustainability programs and will provide the City of Somerville with ongoing support, toolkits, case studies, networks, and national conference opportunities. For more information, you can visit www.iclei.org/co2.*

General Emissions Inventory and Forecast Methods

Overall Inventory Methods:

The emissions inventory and forecast, as well as many of the reduction measures, are separated into two distinct parts, the Community inventory and the Corporate inventory.

Community inventory: a community-wide assessment of all energy use and waste production that occur within the Somerville city limits. All municipal emissions are classified in the commercial sector in this inventory.

Corporate inventory: an evaluation of energy use and emissions related to municipal buildings and operations. Government operations and energy use that are not under the control of City government are not included in this inventory.

A separate inventory of municipal emissions was conducted because the City ultimately has greater control over its own emissions than those of the many private entities within the Somerville community. The City can thus contribute directly to emission reductions in municipal operations and set an example for responsible energy and fuel use for residents and institutions within the community.

The baseline year for the Somerville Community greenhouse gas inventory was 1997. The baseline year for the Somerville Corporate inventory was 1999. These were the earliest years for which a significant amount of reliable data could be generated in each section. Where data was not available for the year chosen historical trends and data from nearby years were used to estimate use for that year. The year 2010 was chosen to project future emissions forecasts and emissions reduction targets.

The inventory required data and technical information to be collected from a wide range of sources including:

- City of Somerville: Department of Public Works, Traffic and Parking Department, Office of Housing and Community Development, Accounting Office, Assessor's Office, Fire, Police, and School Departments;
- State Agencies and Offices: Massachusetts Bay Transportation Authority (MBTA), Metropolitan Area Planning Council (MAPC), Central Transportation Planning Staff (CTPS), Massachusetts Water Resources Authority (MWRA), Department of Environmental Protection (DEP);

- Federal Agencies: Environmental Protection Agency (EPA), Bureau of the Census, Department of Energy (DOE);
- Local Utilities: Nstar Gas (formerly Commonwealth Gas), Keyspan (formerly Boston Gas), Nstar Electric (formerly Boston Edison), private waste haulers;
- Non-Profit Organizations

(A list of contacts providing direct data for this inventory can be found in Appendix B)

The data gathered from these sources was entered into specialized software designed by ICLEI and Torrie Smith Associates. The CCP software calculates equivalent carbon dioxide emissions (eCO_2) from energy use and other inputs. It also translates all energy units into British Thermal Units (BTU) as a common unit of comparison between

energy sources.

Community Emissions Inventory Methods

Residential Homes

To measure Somerville residential emissions, electricity, natural gas, and heating oil use by residential customers were collected. Electricity and natural gas data were collected from local utilities. Heating oil use was estimated using a methodology described below. Jeff Niro, from Nstar Electric (formerly Boston Edison) provided residential electrical consumption for each year from 1990 to 2000. Consumption data from 1990-1997 was used to project consumption in 2010. The KWH consumption was multiplied by a Massachusetts based CO_2 coefficient provided by ICLEI according to the Commonwealth's electricity generation profile.

There are currently two companies providing natural gas service to Somerville residents Keyspan Energy (formerly Boston Gas) and Nstar Gas (formerly Commonwealth Gas). Paul Kam of Keyspan Energy, gathered information on natural gas consumption by their customers in 1997 and provided gas use projections from 2000 to 2006. Scott Johnson of Nstar could only provide data on gas consumption by their customers for the year 2000 and customer counts by sector for the year 1997. These counts were used to estimate 1997 Nstar gas consumption. Projections for consumption to 2010 were based on estimates from the Department of Energy which correlated with the average of the annual projections provided by Keyspan.

It should be noted that gas and electric utilities define residential customers differently. Commercial designation of natural gas accounts are based on the size of the heating boiler and how many units it serves. Accounts with more than 4 units are generally considered Commercial/Industrial accounts by Keyspan and accounts with more than 6 units are considered Commercial/Industrial by Nstar Gas. Both companies consider accounts with less residential. In contrast, Nstar Electric classifies Residential and Commercial/Industrial electricity accounts based on use at individual meters. Therefore, overall energy usage by sector may not be directly comparable between utilities but may be compared by utility consumption as a whole.

Heating oil is not provided by one utility but by any number of the over 300 heating oil distributors in the Boston area. Thus, heating oil consumption was estimated using information from the Energy Information Administration (EIA) of the Department of Energy (DOE) and data from the City Assessor's Office. A DOE study found that in New England, households using oil consumed an average of 836 gallons of oil in 1997 (includes all uses). The average household size was 1914 square feet, making the average consumption rate 0.437 gallons per square foot. This was multiplied by the total square footage of residences in Somerville using oil heat obtained from the Assessor’s office. All heating oil assumed to be light heating oil. Projections for 2010 are based on a 20% decline in residential heating oil use since 1980 according to the DOE.

Estimates for residential propane consumption were calculated using propane consumption data from the EIA and the US Census Bureau. According to the EIA residential propane use is expected to remain constant through 2010.

Somerville Residential Propane Use Calculations (1997)

2000 US Census: 1.3% of Massachusetts households are in Somerville

1999 US DOE: Massachusetts households used 5.5 trillion BTUs of propane

1990 Census: 2.1% of Massachusetts households used propane gas

1990 Census: 2% of Somerville households used propane gas

Conversion Factor: 2/2.1= 0.95

2000 Somerville Residential Propane Use (est. 1997):

5.5 trillion BTUs *1.3%*0.95= 67,925 million BTUs

Commercial and Industrial Operations

The process for calculating emissions for commercial and industrial establishments was similar to that of the residential sector. Jeff Niro of Boston Edison provided commercial/ industrial electrical consumption for each year from 1990-2000 and consumption data from 1990-1997 was used to project forward to 2010**.** All government buildings/operations and non-profit energy use is embedded within the commercial/industrial sector data.

The calculation for heating oil use by commercial/industrial establishments was estimated in a manner similar to residential use. The EIA of the DOE, conducted a study of commercial operations in 1995 that found that the average commercial oil heating rate in New England was 0.28 per square foot. The City assessor was able to provide a current (2001) list of commercial, industrial, and tax-exempt (including municipal) properties that use oil heat and their square footage. The square footage was multiplied by the average commercial oil heating rate according to the EIA. All heating oil was assumed to be light heating oil. Commercial/Industrial heating oil use was projected to remain relatively constant through 2010.

Data is not currently available to make reasonable estimates of commercial/industrial propane use in Somerville. According to the DOE propane use makes up a very small portion of commercial/industrial energy use in general and is assumed to be zero for the purposes of this study.

Transportation Methods

Vehicle Miles Traveled

Fuel used by vehicles in Somerville was calculated by multiplying the total vehicle miles traveled (VMT) of different vehicle types (including transit) within Somerville city limits by their average fuel efficiency.

Vehicle VMT

Vehicle VMT was calculated using average daily traffic data gathered from the *Draft copy of the Somerville Truck Traffic Study* completed for the Somerville Department of Traffic and Parking (Bayside Engineering, March 2001) as well as estimates provided by Todd Blake of the Somerville Department of Traffic and Parking and MassHighway data. Daily VMT was multiplied by 330 to account for traffic volume changes on weekends and holidays. VMT was assumed to be growing at a constant rate of 1.5% per year in order to extrapolate the 2001 VMT calculations to 1997 and 2010.

Total Vehicles in Somerville were broken down into three categories: Buses, Trucks, and Other Vehicles, using estimates from the Truck Traffic Study. MBTA buses, school buses, and the Somerville Crosstown Shuttle were included in the Buses category. The Trucks and Other Vehicles categories were summed and then broken down into Light and Heavy Duty Vehicle categories using 1995 composition estimates from a regional model provided by Vijay Mahal of the Central Transportation Planning Staff (CTPS). It was assumed that light vehicles were autos and light trucks and that all medium and heavy duty trucks were Heavy Duty Trucks. Propane, hybrid electric, and Compressed Natural Gas (CNG) vehicle use in 1997 was minimal and thus assumed to be zero. The national average data for vehicle fuel efficiency provided by the ICLEI software was used to calculate total fuel use[†]. Somerville traffic by type and fuel efficiency was assumed to remain the same through 2010.

Subway and Commuter Rail VMT

MBTA subway and commuter rail VMT was calculated using current commuter MBTA schedules and estimates of rail mileage within Somerville as well as information provided by Conrad Misek of the MBTA Service Planning Department. Commuter rail efficiency taken from a 1994 DEP study and provided by Vijay Mahal (CTPS). The national average electric train energy efficiency rate was provided by ICLEI. Rail and subway service has not changed significantly from 1995 to 2000 and was estimated to remain the constant through 2010. It was assumed that no significant upgrades in service as a result of the Urban Ring Transit Project would be completed by 2010.

[†] Motorcycle vehicle efficiency is not included in the ICLEI software. Thus, motorcycles as a percentage of vehicle traffic was assumed to be zero.

Somerville Crosstown Shuttle

The Somerville Crosstown Shuttle began service just after 1997 and it was not possible to separate its service as a percentage of total bus traffic from the Truck Traffic study data. Because the shuttle buses make up only a small portion of bus traffic in Somerville this is not believed to significantly skew the 1997 estimates. Total annual VMT by the Shuttle, obtained from the *Application for Assistance for a Transportation Demand Management Program* (December 31, 1996), was subtracted from the 2001 VMT estimate before it was extrapolated back to 1997 and was included in the estimate for 2010.

Alternative VMT calculation

For comparison, an alternative VMT number was calculated for the miles driven by Somerville residents. This was estimated by taking the average annual miles driven by Massachusetts licensed drivers multiplied by the number of vehicles registered in Somerville in 1996. The number of vehicles registered in 1996 was obtained from the Assessors office. The vehicle mileage data was taken from the CTPS annual booklet Massachusetts Transportation Facts. This data was not entered into the software for emissions results but was used to generate discussion over vehicle emissions from Somerville residents.

Solid Waste Disposal

The City of Somerville's transfer station, owned by Waste Management, Inc., provided total non-recycled waste tonnage data for all residents, commercial establishments on city trash service, and municipal waste. Many private haulers also collect waste from commercial establishments in Somerville. Data from these private haulers was difficult to obtain. No historical tonnage figures or records were available. Thus, an estimate was used to determine a total solid waste disposal figure using data provided by Waste Management, Inc. and the City's waste hauler, F.W. Russell/Langton and Douglas Contracting, square footage data of establishments not on city trash from the Assessor's office, and estimates of trash generated by square footage and establishment use from the California Integrated Waste Management Board (CIWMB). The data from CIWMB was recommended by Peter Allison of the Commercial Waste Division of the MA Department of Environmental Protection and was determined to provide the best estimation of commercial waste rates in Somerville. Greenhouse gas emissions were calculated using the methane-commitment method in software provided by ICLEI.

Total Community Solid Waste= Total Collected from the City of Somerville (Waste Management) + Estimate of Total Waste Collected by Private Haulers

All the solid waste collected by the City is taken to a transfer station owned by Waste Management. Waste from this transfer station is hauled to one of many several landfills and incinerators in Massachusetts and New Hampshire. According to Shawn Sullivan of Waste Management Inc. approximately 40% of waste from Somerville is landfilled and 60% is incinerated at one of several incinerators in New England. This estimate was found to be consistent with the Waste Management Report to the Department of Environmental Protection. The largest single portion (35%) of the landfilled waste goes to a site in Bristol, New Hampshire. A measure of emissions

from waste hauling was omitted from this inventory. However, these emissions are a source of greenhouse gases and should be considered in any discussion of total emissions as a result of waste generation in Somerville.

It was assumed that private haulers were incinerating their garbage. This is based on information from company representatives and the State's ban on landfill expansion. The residential portion of solid waste production in Somerville was assumed to increase by in projected increased in the residential population, 3.2% by 2010, according to the Metropolitan Area Planning Council. It was assumed that no other sector would see a significant change in solid waste production.

Other Sources

MWRA Drinking Water and Sewage Treatment

Somerville is serviced by the MWRA for both drinking water and sewage disposal. The MWRA serves over 40 communities in the Boston area. The drinking water flows from the Quabbin Reservoir and is treated at a series of intermediate reservoirs along the way to Somerville. All sewage in the Boston area is pumped to the Deer Island Treatment Facility. The treatment plant was under construction during both of the study years, therefore data is a bit inconsistent. Approximately two thirds of the sewage reaches Deer Island by gravity flow. The other third is currently transported first to Nut Island then pumped into the Deer Island facility.

John Edgar, the MWRA Energy Manager, provided the overall energy use of drinking water and sewage pumps and the Deer Island treatment plant. Stacey Donnelly, the MWRA Manager of Community Assessments, provided an estimate of the portion of energy use that corresponds to Somerville drinking water supply and wastewater treatment. From this information, Somerville's share of the energy use for drinking water supply and wastewater treatment was derived. According to Kenneth Chin, an MWRA Engineer, because of a planned focus on water conservation in the Boston area overall use is not expected to change significantly through 2010. Methane emissions from sewage treatment were not included in the inventory.

Municipal Emissions Inventory Methods

SUMMARY

The Municipal GHG Inventory was conducted using data from fiscal year 1999. Departments are not required to complete energy reports that record their monthly energy consumption and expenditures. Therefore, almost all of the data needed for the Municipal GHG Emissions inventory was obtained from original invoices made available through the billing department of the Department of Public Works.

Buildings

The corporate inventory included all data on electricity, natural gas, and heating oil use for municipal buildings that Somerville owns and is billed for utility use. Due to lack of available data on use by fuel oil type and an overall trend towards use of lighter heating oil, all heating oil use was assumed to be light fuel oil. Energy use of public housing facilities provided by the Somerville Housing Authority were not included in the municipal inventory data as the Authority is not directly under municipal control.

Forecasts for building energy use were assumed to be constant except when definite building expansions were planned. This inventory assumes no dramatic changes in winter heating or summer cooling needs. Additionally, increases in electricity use due to continued expansion of information or office technology are not considered. The only confirmed new addition to the municipal buildings sector is the new Edgerly School. TMP Engineering provided data on projected energy use by the Edgerly School.

Vehicle Fleet

All fuel for municipal vehicles and maintenance equipment is purchased in the DPW yard. Vehicle fleet fuel consumption could not be calculated on a department-by-department basis. While an accounting system is in place to provide information on specific municipal vehicles the information was not considered accurate enough to use. Thus, original invoices for fuel delivery to the DPW yard were used to calculate total annual diesel and unleaded fuel use by the city. Lists of municipal fleet vehicles in 1999 were provided by the Department of Public Works (including information on Recreation, Youth Services, Weights and Measures and School fleet vehicles), the Fire Department, and the Police Department.

The school department contracts with a private company for student transportation services thus school bus fuel use is not included.[†] Vehicle emissions from City operations that are contracted out to private contractor for work such as construction projects are not incorporated in this study. The forecast for FY2010 assumed no change in vehicle use or fuel consumption by the City.

Street Lights

All 4100 streetlights and floodlights in Somerville are rented from Nstar (formerly Boston Edison). Lighting in parks, on walkways, and in squares is owned by the City as are traffic signals. Where it could not be separated, lighting outside schools was included in school building energy use. The total amount of outdoor lighting energy use in 1999 was obtained by compiling original invoices in the billing department of the Department of Public Works. Joe Votour in the Department of Lights and Lines provided technical interpretation and billing association. The costs for Boston Edison owned lights included the rental and maintenance fees along with electricity use billing. LED traffic signals were not yet installed in 1999 and are not included in the inventory (see Reduction Measures).

Solid Waste

All non-recycled trash from the City's buildings is collected by F.W. Russell and Sons Disposal, Inc. and Langton Douglas Contracting, Inc. and transported to a transfer station owned by Waste Management, Inc.. Municipal, residential, and commercial trash is collected together and waste could not be separated by sector. It was, therefore, necessary to generate a rough estimate of municipal building trash. First an estimate was generated for the amount of waste collected from commercial establishments on City trash (developed from the City's decal list) and the hauling capacity they pay. Next an estimate of residential trash was generated. Sixty percent of the total tonnage received by Waste Management, following an estimate taken from the EPA's 1996 Characterization of Solid Waste in the United States, was assumed to be residential trash. The commercial and residential estimates were totaled and subtracted from the total collected by F.W. Russell/Langton Douglas Contracting. The remaining tonnage was assumed to be municipal building trash. Yard and park waste were not included because they are not landfilled or incinerated. Total greenhouse gas emissions were calculated using the methane-commitment method in software provided by ICLEI.

Total Municipal Building Waste= Total Waste Collected by City Service (Russell/Langton Douglas) - (Estimated Residential Waste + Estimated Commercial Waste collected by City Service)

All the solid waste collected by the City is taken to a transfer station owned by Waste Management, Inc.. Waste from this transfer station is hauled to one of many several landfills and incinerators in Massachusetts and New Hampshire. According to Shawn Sullivan of Waste

[†] School buses were included in the Community Emissions Inventory.

Management Inc. approximately 40% of waste from Somerville is landfilled and 60% is incinerated at one of several incinerators in New England. This was found to be consistent with the Waste Management report to the Massachusetts Department of Environmental Protection. The largest portion (35%) of landfilled waste goes to a site in Bristol, New Hampshire. A measure of emissions from waste hauling was omitted from this inventory. However, these emissions are a source of greenhouse gas and should be considered in any discussion of total emissions as a result of waste generation in Somerville. Municipal building trash was assumed to remain the same through 2010.

Water and Sewer

The energy use of drinking water supply and sewage treatment at the MWRA Deer Island facility was determined to be beyond the control of the municipal government. Thus these emissions were only included with the community inventory.

Community Emissions Results

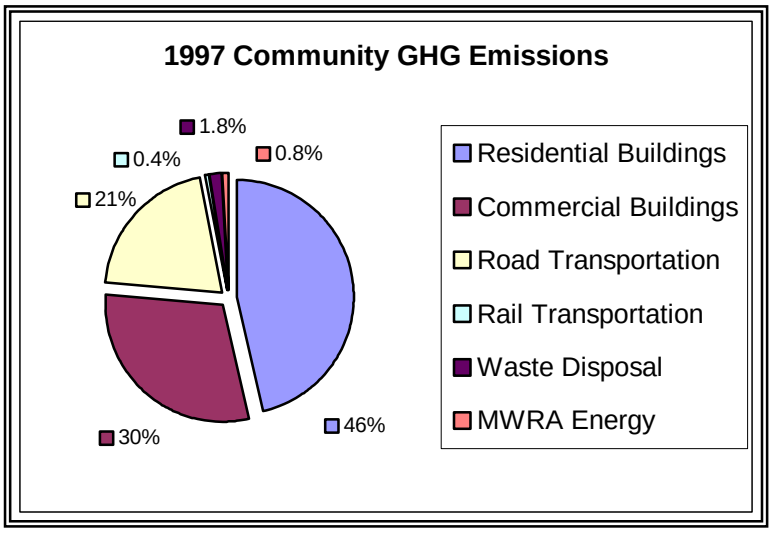
SUMMARY

The City of Somerville produced 734,762 tons of eCO2 in the year 1997. Total residential household energy use (includes electricity, natural gas, and heating oil use) accounted for 46% of these emissions and commercial energy use resulted in 30% of the community's emissions. The other major contribution came from the transportation sector, which provides 21 % of the City's emissions.

Total Greenhouse Gas Emissions

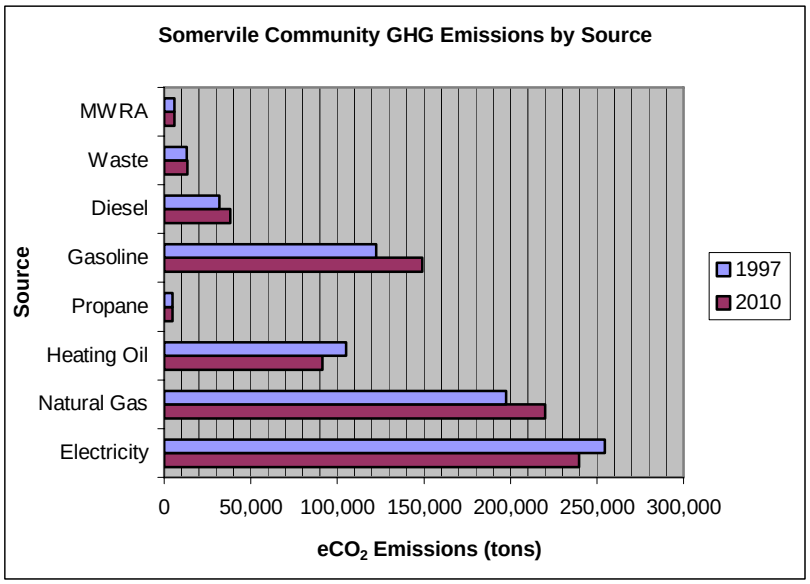
Year	Total eCO_2 (Tons)	Energy Use (BTU's)	Per Capita Emissions
1997	734,762	7,732,976	9.5 tons / person
2010 (forecast)	761,950	8,344,298	9.9 tons / person

It is forecasted that without any action to reduce greenhouse gas emissions, Somerville will be responsible for 761,950 tons of eCO2 production in the year 2010, an increase of 3.7 % over baseline emissions.



Somerville Community Emissions by Source

eCO_2 Source	eCO_2 (tons)		Energy (mil BTU)	
	1997	2010	1997	2010
Electricity	254,342	239,889	1.136	1.147
Natural Gas	197,397	219,932	3.341	3.723
Heating Oil	104,955	91,311	1.328	1.155
Propane	4,721	4,721	0.068	0.068
Gasoline	122,614	148,984	1.473	1.790
Diesel	31,794	37,980	0.386	0.461
Waste	13,125	13,319	n/a	n/a
MWRA	5,814	5,814	0.028	0.028
Total	734,762	761,950	7.733	8.344



Per Capita Community Emissions

According to the US Census, Somerville had a population of 76,210 in 1990 and 77,478 in 2000. The population was estimated to be 77,098 in 1997. The Somerville population is projected by

the Metropolitan Area Planning Council to grow to 79,975 persons in the year 2010, an increase of 3.2%.

Somerville's emissions are 9.5 tons of eCO_2 per capita. This is lower than other cities and towns of comparable size in the Northeast. This can be attributed to the fact that Somerville is a very dense community of nearly 20,000 people per square mile. Somerville is an older community that is mostly built out and does not expect to see a significant growth in population. Therefore eCO_2 emissions should not rise drastically unless there is an increase in per capita energy consumption or accelerated personal vehicle use. The City of Somerville should be able to take action to reduce its total eCO_2 emissions below the 1997 baseline level by the year 2010.

CCP Community Comparisons

Community	Population	Total eCO_2 Emissions (tons)	Per Capita (tons per person)	Base Year of Inventory
Somerville, MA	77,098	734,762	9.5	1997
Burlington, VT	39,127	438,931	11.2	1990
Brookline, MA	54,718	626,512	11.4	1995
Cambridge, MA	95,802	1,695,117	17.7	1990
Medford, MA	57,400	696,112	12.1	1995
Arlington, MA	43,835	335,063	7.6	1997
Newton, MA	82,585	1,973,540	23.9	1990
Gloucester, MA	29,456	351,908	11.9	1998

COMMUNITY EMISSIONS BY SECTOR

Greenhouse Gas Emissions by Sector

Year	Residential (Tons eCO_2)	Commercial (Tons eCO_2)	Transportation (Tons eCO_2)	Waste & Sewage (Tons eCO_2)

1997	339,900	221,339	154,584	18,939
2010	338,823	216,864	187,937	19,133

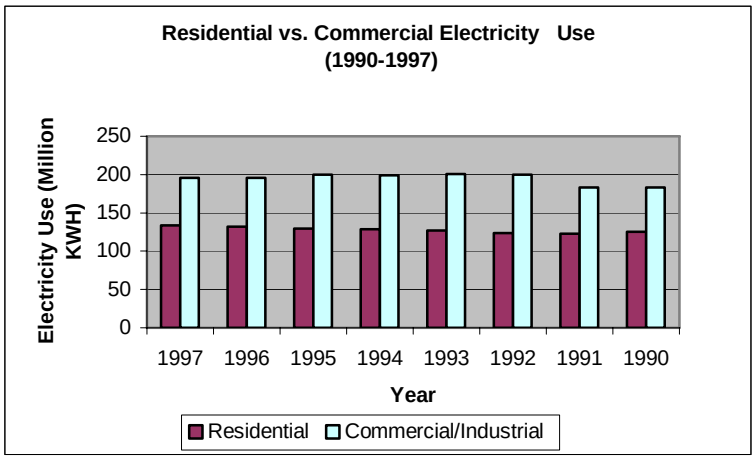
Residential Sector

The residential energy sector was the largest contributor to greenhouse gas emissions in 1997. About 30% of these emissions came from electricity use and 42% came from natural gas. Heating oil use represented approximately 26% of total emissions. Despite a forecasted increase in use residential electricity emissions were projected to decrease by 5.7% in 2010 due to cleaner electricity generation measures instituted since 1997. Residential natural gas use and emissions were projected to increase by 11.4%. Residential heating oil use and emissions were projected to decline by 13% as a result of improved heating efficiency as old boilers are replaced with new ones that have the capacity to transition to natural gas. Both oil and natural gas use will also be affected by higher heating efficiency and better insulation in homes.

Commercial Sector

The commercial sector was the next largest contributor to greenhouse gases in Somerville. Electricity use of commercial accounts was the highest single source of eCO_2 and resulted in 69% of commercial emissions and 21% of all community emissions. Commercial natural gas use was estimated as 24% of total commercial energy use. Estimates of natural gas use by sector indicate that commercial use is 2.5 times less than residential use. However, because of differences in the way that local utilities define residential and commercial accounts (see Community Residential Methods) it is likely that there is an even greater separation between gas use in these two sectors. Despite a forecasted increase in use, commercial electricity emissions were projected to decrease by 5.6% in 2010 due to cleaner electricity generation measures instituted since 1997. Natural gas use and emissions were projected to increase by 11.4%. Oil use and emissions were projected to decline by 13% according to DOE estimates.

Energy use from Somerville's municipal buildings is included in the commercial sector of the Community inventory. Estimates from 1999 municipal inventory indicate that municipal buildings and operations contribute over 12,000 tons of



eCO_2, or approximately 5.4% of commercial emissions.

Weather is also a significant factor when considering annual energy use. The year 1997 was cooler than average. According to the National Weather Service data, in 1997 the Boston area had a total of 6237 heating degree-days (FY1997), and 433 cooling degree-days (CY1997). This is 596 more heating degree-days (FY) and 245 less cooling degree days (CY) than the Boston average from 1961-1990. (A degree-day is a unit used to measure building energy needs. It is calculated with the summation of degrees Fahrenheit each day the average temperature is below or above 65. For example one 90 degree day equals 25 cooling degree-days.) Therefore, home heating energy use in 1997, primarily natural gas and heating oil, is likely to be slightly higher than average.

The high levels of emissions from electricity use in the community, both residential and commercial, point to two opportunities for an emissions reduction action plan. The first is aggressive energy conservation and efficiency efforts in commercial and institutional buildings and homes. The second is developing a block electricity purchasing account in order to transfer a large portion of the City's electricity demand to cleaner energy sources.

Transportation Sector

Somerville's automobile traffic continues to grow annually. All road transportation released 154,584 tons of eCO_2 into the air annually. This is expected to increase to 187,130 tons by 2010, assuming there is not a dramatic increase in net vehicle efficiency. Despite technological advances in automobile fuel efficiency, the collective fuel efficiency of personal cars on the road has not improved in the past 20 years due in part to consumer preference for larger vehicles such as sport utility vehicles.

The emissions data above is based on the total vehicle miles traveled by cars within Somerville, not miles driven by Somerville residents. For comparison, the number of vehicles registered in Somerville in 1996, 55,000, was multiplied by an estimate of average annual mileage driven by Massachusetts' residents, 11,500, from the Central Transportation Planning Staff's annual booklet Massachusetts Transportation Facts. Assuming the cars and trucks currently registered in Somerville drive the state average mileage they are responsible for nearly three times the total VMT and nearly 2½ times the CO_2 emissions of vehicles driven within Somerville city limits. Despite the growth of economic development along the Route 128 corridor, Somerville's urban location makes it unlikely that Somerville residents travel the same distance as the state average. However, this approximation demonstrates that residents of Somerville are responsible for a large portion of greenhouse gas emissions emitted outside of city limits.

According to the Somerville Truck Traffic Study truck traffic amounts to 4.5% of the Somerville's total VMT and bus traffic amounts to 2%. Total annual VMT of buses and medium

and heavy trucks in Somerville was estimated as over 14 million miles. Corresponding emissions from bus and truck traffic were estimated as 24,946 tons of eCO_2. Large trucks are less efficient than cars but at the same time tend to run mostly on diesel fuel. Diesel fuel delivers greater miles per gallon efficiency than unleaded gas, however each gallon emits a greater quantity of CO_2 and particulate matter.

The portion of subway and commuter rail system service in Somerville was estimated to generate 3,204 tons of eCO_2. The 2010 forecast assumed no change in MBTA routes or the transit vehicle fleet. Even with no change in service, cleaner electricity generation is expected to slightly reduce these emissions to 3,193 tons in 2010. Newer, more efficient trains may further reduce emissions in this sector in the future.

Solid Waste

It was estimated that in 1997, over 67,000 tons of waste were generated in the City of Somerville. Twenty-two percent of this waste was landfilled generating 7,867 tons of eCO_2 and 78% of the waste was incinerated generating 5,258 tons of eCO2. Most of the emissions from incineration are determined to be releases from burning plastics as organic materials, including paper, are not considered to be contributors to greenhouse gases when incinerated. All trash collected by the City's service is transported to the Somerville transfer station and then shipped to various locations throughout the Northeast. The emissions that resulted from hauling waste to landfills and incinerators in the Northeast were not calculated, however, these emissions are a source of greenhouse gases and should be considered in any discussion of total emissions as a result of waste generation in Somerville.

Somerville Community Waste Calculation (1997)

Total Waste Collected by the City of Somerville: 37,041 tons/yr
(Waste Management Invoices)

Total Waste Collected by Private Haulers: 30,358 tons/yr
(Estimated Using Assessor's Square Footage, State Use Codes, and CIWMB Waste Estimates by Use and Sq. Footage)

Total Somerville Waste: **67,399 tons/yr**

Sewage

The Massachusetts Water Resources Authority handles all drinking water and sewage treatment services for the City. Somerville is responsible for approximately 3% of the total MWRA energy use attributed to drinking water and sewage treatment services in the MWRA service area. In 1997, MWRA drinking water service cost the Somerville community $2,410,517 and sewer and sewage treatment services cost $9,117,792. No major change in Somerville drinking water use is expected in the next 10 years. The expansion of sewage treatment services and the new outfall pipe may increase the cost of sewage treatment after 2000 but, the amount of water treated should not increase significantly. According to Kenneth Chin, an MWRA engineer, the Authority does not expect any significant increases in the amount of wastewater sent to the plant in the next 10 years. The new treatment facilities were designed with the intention of concentrating future efforts on community wastewater conservation strategies rather than significantly increasing wastewater treatment capacity.

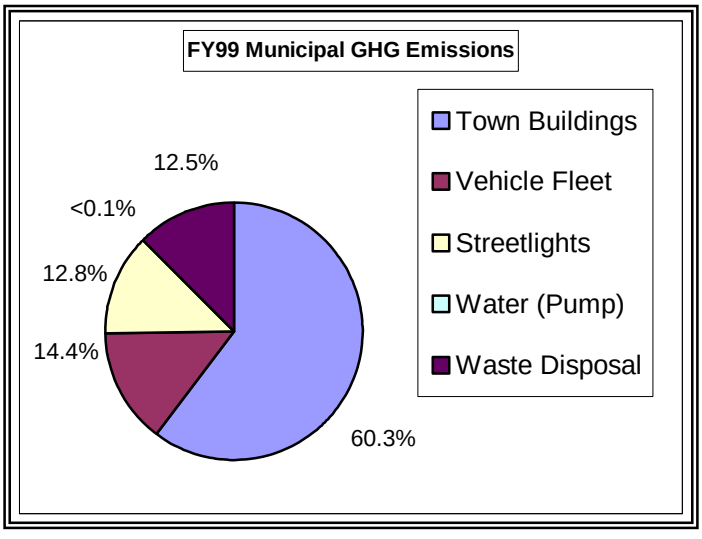
Municipal Emissions Results

SUMMARY

The results of the municipal inventory are based on the fiscal year (July 1st to June 30th). City of Somerville municipal operations generated 20,525 tons of eCO_2 in FY 1999. Buildings accounted for approximately 60% of the town's emissions. The vehicle fleet and streetlights were the next two largest contributors. Electricity use was the energy source responsible for the greatest percentage of emissions. The City's operations in 1999 were almost 3% of the community's eCO_2 emissions in 1997. Municipal energy use and greenhouse gas emissions are expected to increase slightly to 21,403 tons by 2010.

FY99 Municipal Greenhouse Gas Emissions by Sector

Sector	eCO_2 (tons)	eCO_2 (%)	Energy (mil BTU)	Costs ($)
Town Buildings	12,374	60.3	97,982	1,681,057
Vehicle Fleet	2,952	14.4	34,548	193,999
Streetlights	2,634	12.8	12,595	803,656
Water (Pump)	1	0.005	2	347
Waste Disposal	2,563	12.5	n/a	429,459
Total	**20,525**	**100**	**146,126**	**$3,108,519**



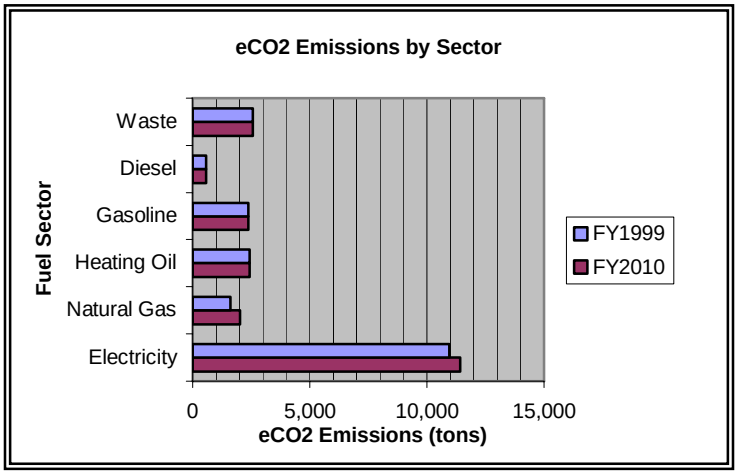
Many department and division

leaders have already begun work towards energy efficiency, fuel emission reduction, and waste reduction including the following efforts:

- Many of the City's traffic lights have been switched to LED signals.
- The building department has installed energy efficiency lighting in every municipal building.
- All City garages are currently heated with recycled motor oil.
- Many municipal buildings have recycling programs.

Somerville Corporate Emissions by Energy Source

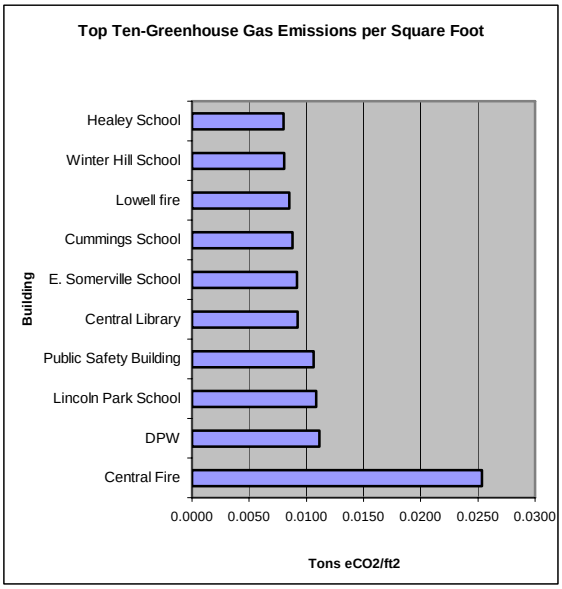
eCO_2 Source	eCO_2 (tons)		Energy (mil BTU)	
	FY1999	FY2010	FY1999	FY2010
Electricity	10,955	11,434	52,375	54,661
Natural Gas	1,616	2,016	27,357	34,132
Heating Oil	2,438	2,438	30,847	30,847
Gasoline	2,375	2,375	28,530	28,530
Diesel	577	577	7,017	7,017
Waste	2,563	2,563	n/a	n/a
Total	20,525	21,403	146,126	155,188

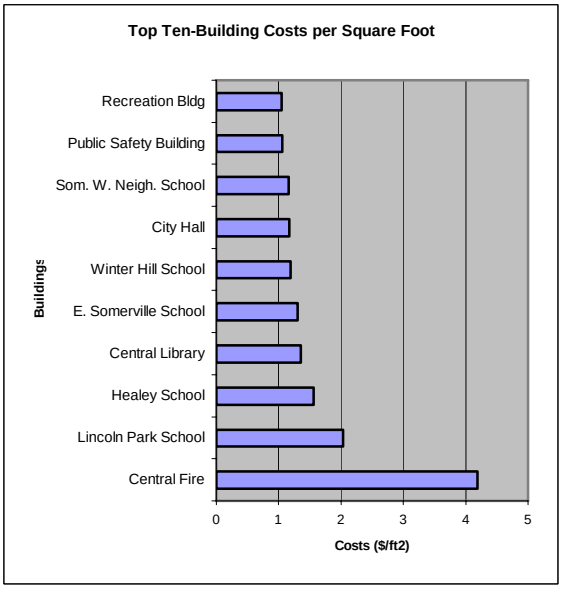


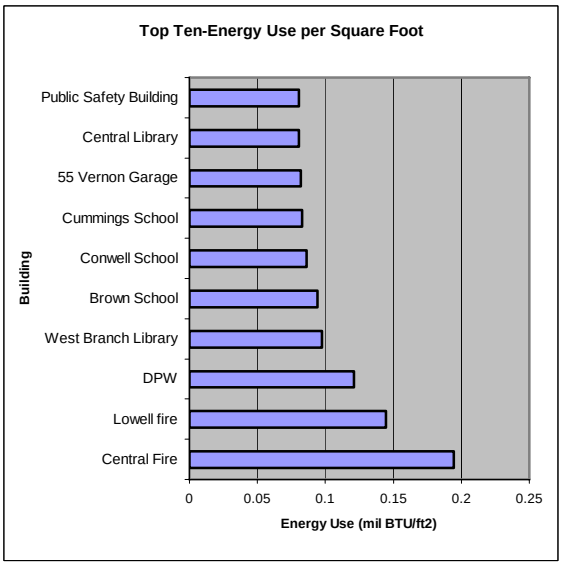
Buildings

The City's buildings are the largest contributor to greenhouse gases within the municipal inventory. Collectively buildings contributed 12,374 tons of eCO_2 in 1999 costing the city $1,681,057. The three buildings with the highest overall energy use were the Somerville High School, the DPW yard, and the Public Safety building.

Somerville High School was the largest single contributor to greenhouse emissions. It produced 2,285 tons of eCO_2 in 1999 costing $288,821. It represents approximately 19% of all building energy use and building CO_2 emissions. It accounts for nearly 13% of all municipal energy use all by itself. There are at least two factors that explain the High School's high level of energy use. First, the City government's cable TV channels (Ch. 15 & 16) are located in Somerville High. The studio is operational 24 hours a day and is probably responsible for a good portion of the building's energy use. Secondly, steam from the High School's oil heating system is used to heat all of City Hall.







Building energy use was also analyzed by energy use, CO_2 emissions, and cost per square foot to provide a more accurate way to compare buildings to one another (see Appendix C). The Central Fire Station was the highest in all three categories. Central Fire, the Central Library, and the Public Safety Building were among the ten highest buildings in all three analyses. Four of the top six most expensive buildings to supply energy to per square foot have electric heat.

School buildings collectively represent 8,698 tons of eCO_2 , 70% of total building emissions, and energy costs of $1,263,712. The three schools with the highest overall energy use were the three largest schools, Somerville High School, Powderhouse Community School, and the Kennedy School. The three schools using the most energy per square foot were the Brown School, the Conwell School, and the Cummings School. Four of the top six most expensive schools to supply energy use to per square foot have electric heat. Electricity produces over 2.5 times the eCO_2 emissions of heating oil per million BTU's of energy and over three times the emissions of natural gas.

The only confirmed change in municipal energy use is that of the new Edgerly Education Center. The school is being designed to include many energy conservation features and is expected to be very energy efficient. TMP Engineering, a firm working closely with the architects for the school provided rough estimates of electricity and natural gas use.

Assuming current prices annual electricity use for the new school was estimated at 670,000 KWH and annual natural gas use at 67,750 therms. Energy use projected for the new school corresponds to an increase in annual municipal emissions of 879 tons of eCO_2 in 2010.

Vehicle Fleet

The City consumed 227,017 gallons of unleaded fuel and 50,528 gallons of diesel fuel in FY99 costing $193,999 and resulting in the production of 2,952 tons of CO_2. Over 1/3 of the vehicles in the City's operational fleet were built before 1990 (See Appendix D). Currently the average city driving efficiency of cars in the municipal fleet is around 14 mpg.

One quarter of the City's fleet are diesel vehicles. Diesel vehicles get better mileage per gallon and diesel fuel is cheaper than unleaded gas. However, diesel fuel does produce higher levels of pollutants, such as CO_2 and particulates, per gallon than gasoline. The purchase of 'clean' diesel fuel may reduce some of these emissions

DPW vehicle and fuel use is affected by winter weather conditions. Heavy snowfall and icy road conditions require increased use of DPW vehicles to clear roadways. Snowfall in FY99 was 35.7 inches, however, lower than the Boston average of 42.4 inches, according to the National Weather Service. Thus FY99 fuel use may be slightly lower than average. Use was assumed to remain the same through 2010.

Street Lights

Outdoor and traffic lighting generated 2,634 tons of eCO_2 emissions in 1999. Somerville's street and floodlights, 4100 in all, are rented from Nstar Electric (Boston Edison). The City has recently upgraded all of these lights to high-pressure sodium bulbs. The City owns lights in parks

and park walkways, ornamental lighting in major squares, lighting for underpasses, and all traffic signals. Ornamental lighting in squares such as Davis and Union are lit by mercury vapor. The City is currently considering the purchase of all of the Nstar lights to gain more control over their service and to save long-term costs. A survey has been completed to determine the feasibility of this option. Because of the recent street and floodlight upgrade it may not be cost effective at this point in time. Lighting energy use and emissions were assumed to remain the same through 2010.

Lighting Account	FY99 KWH Use	Costs
Street/Flood	3,165,951	$736,158
Parks & Holiday	186,286	$22,484
ComElectric	17,325	$1,567
Traffic Control	320,627	$43,447
Total	**3,690,189**	**$803,656**

Solid Waste

Municipal buildings were estimated to generate 6,230 tons of non-recycled waste. Total FY99 disposal costs were nearly $430,000. Approximately 40% of waste collected from municipal buildings, or 2492 tons, is landfilled, and 60%, or 3740 tons, is incinerated at one of several incinerators in New England. Landfilled waste produced 2,189 tons of eCO_2. Incinerated waste was multiplied times an EPA CO_2 coefficient for greenhouse gas emissions from municipal trash incinerators and estimated to produce 374 tons of eCO_2 emissions. These emissions are mostly the result of plastic incineration as organic materials from plant products result in a 'zero net gain' of atmospheric carbon.

Somerville Municipal Waste Calculation (FY1999)

Total Waste (Res., Muncpl. Bldg, and Comm. Accts. On City Service)	34,394	tons/year
(F.W. Russell/Langton and Douglas Contracting original invoices)		

Residential waste=	37,041* 0.60=	22,225	tons/year
(Residential waste ~60% of municipal solid waste http://www.epa.gov/epaoswer/non-hw/muncpl/mswrpt97/msw97re.pdf)			
Commercial waste on City Service =		5,939	tons/year
(Estimated from 1999 City Trash Decal List)			
Residential + Commercial Waste on City Service=		28,163	tons/year
Municipal Building Waste=	34,394-28,163=	6,230	tons/year

All trash from the City's buildings is transported to the Somerville transfer station and then shipped to various locations throughout the Northeast. The emissions that resulted from hauling waste to landfills and incinerators in the Northeast were not calculated, however, these emissions are a source of greenhouse gases and should be considered in any discussion of total emissions as a result of waste generation in Somerville.

Greenhouse Gas Emission Reduction Measures

Listed below are options for consideration to reduce greenhouse gas emissions in Somerville. The summary list below is followed by brief program descriptions. An effort has been made to quantify CO_2 or eCO_2 (equivalent CO_2) reductions when possible, using either preliminary inventory results or examples from programs in other municipalities. More research is needed to accurately estimate the results of each particular measure in terms of both emissions and finances.

Existing or Pending Measures

This list includes efforts under consideration or already underway to conserve energy or reduce waste in Somerville. It also recognizes programs with goals or priorities other than energy savings or waste reduction that have greenhouse gas reduction benefits. Some existing measures have the potential for program extensions that would further reduce greenhouse gas emissions.

Strategies for Reducing Greenhouse Gas Emissions in Somerville

Community Programs	**Department Responsible**
Energy	
Energy Conservation/Efficiency Programs	OHCD
Transportation	
Pedestrian Friendliness of Intersection & Squares	Traffic/Highway
Traffic Calming	Traffic/Highway
Police Units on Bicycle	Police
Bike Path Extension	
Support for Urban Ring Transit Project	OHCD/Traffic
Somerville Crosstown Shuttle	OHCD
Waste	
Curbside Compost and Recycling Pick Up	Sanitation
Other	
Tree Planting/Open Space Preservation	Parks/Highwy/OHCD

Municipal Programs	**Department Responsible**
Buildings	

City Building Lighting Efficiency	Building/OHCD
City Building Heating and Cooling Efficiency	Building/OHCD
Energy Efficient Building Design	Building/OHCD
Vehicle Fleet	
Fleet Vehicle and Equipment Efficiency	Highway
Street Lights	
LED Traffic Signals	Highway
Street/Floodlighting Retrofit	Lights and Lines
Waste	
Municipal Paper Recycling	Env./Sanitation
Purchasing of Recycled Products	Purchasing

New Proposals

Below is a wide range of initiatives that may be considered for implementation in order to reach a greenhouse gas emission reduction goal by the year 2010. Many of the ideas listed below follow the example of other local government efforts to reduce emissions. Some are ideas unique to the energy and/or transportation needs and opportunities in Somerville. Measures marked with a " ***** " indicate recommended programs that potentially can be implemented within one year.

Community Programs	**Department Responsible**
Energy	
*Develop Energy Efficient Building Code	Building/Engineering
*Climate Change Outreach and Education	Education/Env.
Block Purchasing of Green Energy	Aldermen
Encourage Participation in Solar Boston	Building/OHCD
Transportation	
*T pass payroll purchase/discounts for City employees	Personnel
*Designated Bike Lanes and Bike Routes	OHCD/Traffic
*Increase Bike Facilities	Traffic/OHCD
*Support for Car Sharing Program	Env./OHCD
*Tele-Commuting Option for City Hall Employees	All departments
Anti-idling ordinance	Aldermen

Transportation Efficient Development Zoning	OHCD
Lobby for increased federal CAFE standards	Aldermen
Pressure for Increasing T Quality of Service	Traffic/Aldermen
Waste	
Ordinance / Permit Requiring Recycling	Env./Aldermen
Other	
Sustainable Business Awards	OHCD/Env.

Municipal Programs	**Department Responsible**
Buildings	
*Energy Efficient Office Equipment Procurement Standards	Purchasing
*Municipal Buildings Energy Efficiency Standards and Goals	Building
*Increase shade cover over municipal parking facilities	Grounds
LED Exit Signs	Building
City Purchase of Clean/Green Energy	Aldermen
Solar Hot Water and/or PV on public buildings	Building
Garden Roofs on Municipal Buildings	Building
City Owned Demonstration House	Building
Energy Impact Report for all Improvements Plans	Selectmen/Building
Vehicle Fleet	
Downsize municipal fleet vehicles	All departments
Alternative Fuel Vehicle replacement of fleet	All departments/DPW
Other	
*Emphasize importance of developing and meeting greenhouse gas emissions reduction goals to department heads and employees	All
* Initiate discussion on collective greenhouse gas emission reduction strategies with surrounding communities	Mayor/Env.

Existing or Pending Programs

Community

Energy

Energy Conservation/Efficiency Program

A regional Weatherization and Heating Conservation Program funded by DOE via the States Bureau of Energy Programs, and located in Arlington, is available to Somerville residents. The City of Somerville offers funding to income eligible property owners through CDBG and/or HOME funds for heating system replacement and for other energy conservation related improvements.

Extension: Offer tax or other incentives to encourage people to weatherize their homes and purchase energy efficient equipment. Private sector energy audits and retrofits could be encouraged through permitting processes or design reviews.

Transportation

Increase Pedestrian Friendly City Centers & Intersections / Traffic Calming

Pedestrian friendly areas promote transit use, combined vehicular trips, bicycle travel, and walking as a form of transportation. Somerville promotes walkability with well marked and reflective crosswalks, wide sidewalks, traffic signals prioritizing pedestrians, cross guards, and signage. Somerville may want to consider investigating other measures such as raised crosswalks and intersections that will reduce vehicular speed and gasoline emissions.

Police Units on Bicycle

Somerville has several bicycle police patrols throughout the city. Moving police out of their cars and onto bikes can offer higher levels of protection in dense areas while reducing municipal fuel usage. Bicycle policemen can act as role models encouraging bicycle use as a legitimate transportation option and can lead the town in establishing safe roads for cyclists. The city of Berkeley, CA estimated an 8 ton reduction in eCO_2 from their police bike patrols.

Extension: Increase the number of police bike patrols

Bike Path Extension

Somerville is currently considering extending the Minuteman community bike path that currently runs from Lexington to just past Davis Square. It is estimated that on weekdays as many as 200 cyclists per hour use the bikeway for a variety of activities. In addition to providing an excellent recreational opportunity extending this trail could encourage many to commute and run errands by bike during warmer months reducing vehicle emissions in Somerville and its surrounding communities.

Support for Urban Ring Project

Somerville endorses the MBTA Urban Ring transit route and signed the Urban Ring compact with Boston, Cambridge, Everett, Chelsea, and Brookline. This transit route will provide vital transportation and economic links between many Boston area communities reducing the need for personal vehicle use in the Boston area.

Somerville's CrossTown Shuttle

This Somerville service establishes links between commercial centers, existing transit hubs, and community centers, and provides service to areas of Somerville without the density to support MBTA access. This service also provides access to areas of City that non-automobile drivers such as seniors, students, and low-income populations may have difficulty reaching otherwise.
Extension: This service is an excellent asset to the Somerville community, however, the public may be unaware that it exists for their general use. Consider increasing the marketing and visibility of this service to increase ridership and reduce short vehicle trips.

Waste

Curbside Compost and Recycling Pick Up

The City's municipal curbside recycling program collected 3438 tons of paper and 860 tons of co-mingled containers in 1999. Collectively this resulted in a 12% reduction total solid waste collected by the city service and the savings of 1,168 tons of eCO_2 emissions. Recycling prevents eCO_2 emissions from waste hauling, landfilling, and incineration as well as energy savings from resource recovery.

Extension: Work to increase Somerville's recycling rate through community outreach and education.

Other

Street Tree Planting / Open Space Preservation

Trees act as sinks for carbon dioxide as well as providing shade that can act to keep pavement cool in the summer and lower temperatures in urban areas. Parkland also provides aesthetic and recreational opportunities to local residents. The City currently maintains trees along roadways and in the City's parks. Somerville has recently completed an Open Space plan outlining its goals for protecting Open Space within city limits.

Extensions: Local landscaping companies may be interested in planting and maintaining trees in local squares, near large parking lots, or along roadways in exchange for the ability to advertise in the space they maintain. Three percent of Somerville land is currently open space. The national average is 5%. The City may want to consider ways to increase open space in Somerville.

Municipal Programs

Buildings

Building Lighting Efficiency

The city has upgraded all buildings to energy efficient T-8 fluorescent lamps and ballasts. The Teele Square Fire Station was upgraded to an energy efficient lighting system under an EPA grant.

Building Heating and Cooling Efficiency

Several municipal buildings currently operate with HVAC systems and the city employs trained technicians to insure they are operating efficiently.

Extension: Consider undertaking a cost/benefit analysis for upgrading oil and electric heating systems in older buildings to natural gas central heating systems. Electric heating systems are the least efficient and most expensive systems to operate and should be considered top priority for conversion. It may be possible to negotiate with local natural gas providers to reduce installation costs. By converting from oil to gas Medford saved 73 tons of eCO_2 emissions per year in its City Hall and 665 tons of eCO_2 at its high school. As a result of successful negotiations with Keyspan Gas they did not pay any installation costs.

Energy Efficient Building Design

The new Edgerly school is being designed with several energy conservation measures including an energy efficient natural gas central heating system, maximized use of daylighting, and an outer shell and insulation that exceed state and federal energy code requirements.

Extension: Consider employing performance-based contracting measures that allow contractors to recoup some of the savings from energy efficiency thus encouraging more energy efficient development.

Vehicle Fleet

Increase Fleet Vehicle and Equipment Efficiency

The City budget has provided funding for departments to upgrade many fleet vehicles and maintenance equipment on a fairly regular basis. This has allowed the retirement of many old inefficient engines. In general new engines contribute less CO_2 to the atmosphere than those in older vehicles. Currently the average city efficiency of cars in the municipal fleet is near 14 mpg.

Street Lights

LED Traffic Signals

The DPW has purchased and is in the process of installing LED lights for the green and red signals at most of the traffic signals in Somerville. LED lights use 80-90% less energy then the original bulbs. In 1997, traffic signals used 320,627 kWh of electricity at a total cost of $43,447. A study in Sacramento, CA found 87% energy savings at one intersection where red, green, and pedestrian lights were converted to LED. LED lights also require 1/6 the maintenance of incandescent bulbs, often needing replacement only every 8-10 years. The energy savings from the installation in Somerville is conservatively estimated at 75% per signal. This will result in an energy savings of 240,470 KWH of electricity, a CO_2 reduction of 172 tons, and a savings of up to $33,000 annually.

Extension: Many other City-owned traffic lights such as flashing red lights, school crossing lights, yellow signal lamps, and pedestrian crosswalk signals could be switched to LED.

Street/Flood Lighting Retrofit

The 4100 streetlights and floodlights in Somerville are rented from Nstar Electric and have just recently been upgraded to high-pressure sodium. The City recently completed a survey to consider the purchase of all of the Nstar lights in order to gain more control over their service and to save long-term costs.

Waste

Recycling in Municipal Buildings

The City currently recycles paper in municipal buildings and container recycling in schools with plans to increase this service in the future. It is estimated that municipal buildings recycle approximately 1% of their paper waste or 48 tons of paper annually. This results in a reduction of 53 tons of eCO_2 emissions. One ton of recycled paper saves 4077 KWH of energy from the manufacturing process**.**

Extension: Consider expanding the City building recycling program. Students could adopt a local municipal building and complete a school recycling audit. Paper recycling already exists on a small scale in municipal buildings. An increase in the paper recycling rate would be very easy to implement and could prove to be especially lucrative depending on the market prices for recycled paper materials. If Somerville municipal buildings were able to recycle 25% of their paper products they would reduce their annual paper waste by 1200 tons preventing 578 tons of eCO_2.

Purchase of Recycled Paper Products

The key to promoting the growth recycling of the recycling industry is the purchase of recycled products. Depending on percent composition recycled paper can reduce air pollution by 74% and use 64% less energy use to manufacture than paper from wood. Currently the City's office paper supply is 30% post-consumer recycled content.

Extension: Consider a municipal procurement policy for recycled materials.

New Proposals

Community

Energy Efficient Building Code

The state has developed building code regulations that set standards for quality and safety. The City could develop a regulatory or voluntary green building code that would require enhanced energy efficiency design in all new structures or substantial additions. The Cities of Austin and Fort Collins have implemented a voluntary code that lays out very progressive parameters for sustainable design and construction. Fort Collins, CO estimated a future savings of 1665 tons of eCO_2 from its voluntary green building program.

Climate Change Outreach and Education

The City could build curriculum resources that specifically discuss climate change issues with a focus on positive solutions for the future. Partnerships with local universities, governmental agencies, and non-profits can provide links with science or policy experts as well as opportunities for experiential learning. Additional outreach to citizens and businesses may include public displays, tabling at local events, continuous public forums, press coverage, and citizen participation in the CCP process.

Block Purchasing of Green Energy

With the deregulation of electricity in Massachusetts consumers are free to change their electricity provider. Some electricity providers can now sell green energy options that draw electricity from renewable energy resources. City residents and businesses, as well as the government could build a block purchasing group to buy green power at a lower cost from a new energy provider.

Encourage Participation in Solar Boston

The Boston Oil Consumer Alliance is leading a collaborative effort to install 10,000 solar water heating or PV systems on homes and businesses in the Boston area over the next 10-20 years. Hot water systems cost between $3000 - $6000 however, the state offers income tax credits and property tax exemptions for residents installing solar systems. Medford Solar is another program that allowed homeowners to lease PV systems installed on their roofs. Response to this program exceeded expectations.

Transportation

T Pass Discounts for City employees / On-site or Payroll Deduction Purchasing Option

The MBTA offers means for employers to provided employees on-site or payroll deductions for purchasing monthly passes to encourage transit use. The payroll deduction option allows the pass to be paid before taxes, thus resulting in a 20-30% savings. Providing easy and more affordable access to transit passes for various members of the Somerville community could reduce local VMT burdens. Similar operations could be undertaken at the high school or any local business employing more than 5 transit riders. Currently public transportation carries 10% of Boston metropolitan area commuters.

Designated Bike Lanes and Bike Routes / Increase Bike Facilities

The four greatest impediments for commuters choosing to bicycle to work are safety, weather, distance, and inadequate facilities for storage or changing at destinations. Better infrastructure in the form of bike lanes, racks, and municipal employee facilities and commercial centers can encourage more bicycling in Somerville. Walking and biking are the only zero emissions forms of transportation. A study in Seattle found duel direction bike lanes on one street reduced VMT by 14,500 miles and eliminated 7 tons of eCO_2 annually.

Support for Car Sharing Programs

Car Sharing allows residents to become members of an organization that places vehicles around the City for short-term hourly use. This provides people who need a car for occasional use access to a local vehicle without having to own their own. In Portland, Oregon Car Sharing Portland found that 26% of its members sold their car and 53% of participants avoid purchasing a vehicle as a result of the car sharing program. In Cambridge, a commercial Car Sharing company, called ZipCar has recently started up. They have reserved designated parking spaces in neighborhood and commercial centers within Somerville and Cambridge.

Tele-Commuting Option for City Hall Employees or Local Businesses

The City could provide the technology and the flexibility for certain employees to take advantage of telecommunication advances and reduces their number of trips to work. Each department would need to evaluate where this is possible and how such a program can be established fairly. Reducing 2 commutes a month per employee can have significant VMT and emission reductions. A program could be implemented to encourage employers in Somerville to initiate tele-commuting options as well.

Anti-idling Ordinance

Somerville could consider establishing zones where idling would be discouraged through signage. Even if such an ordinance were not strictly enforced the signage may do much to decrease car and truck idling in the city thus reducing vehicle emissions and improving air quality.

Energy and Transportation Efficient Zoning

Mixed-use zoning and cluster development are frequently established as measures to decrease the energy inefficiency of sprawling land use patterns**.** The establishment of alternative zoning regulations to encourage energy and/or transportation efficiency in areas of future high density development could significantly reduce Somerville's vehicle emissions.

Lobby for Increased Federal Corporate Average Fuel Economy (CAFE) Standards

Although the City can work to increase the fuel efficiency of its vehicle fleet, it has little control over the vehicle choices of its residents and commercial employees. The federal government does however have the ability to set standards for automobile fuel efficiency particularly through the CAFE standards. These standards have not been raised since 1975 (implementation began in 1985). They are currently set for an average of 27.5 mpg for a manufacturer's entire line of cars and 20.6 for an entire line of light trucks (including SUVs.) Proposed new standards would be 45 mpg for cars and 34 mpg for light trucks. If lobbying for higher CAFE standards is successful the city will see a significant decrease in vehicle emissions by 2010. Fort Collins, CO and Portland, OR have made similar measures as part of their local action plans.

Increase T Quality of Service

Lobby the MBTA to work to improve service within Somerville. Such improvements may include: the purchase of clean fuel buses, installation of bus shelters with schedules and maps, more frequent service, expanded bus routes, provision of bus transfers, bike racks on buses, and avoiding fare increases. Additionally the City can continue to support MBTA operations in its road and traffic signal improvements. The City has already registered its support of the Transit Urban Ring Project currently being researched by the MBTA and CTPS.

Waste

Pass Bylaw Requiring Recycling Services

Municipal curbside recycling only reaches residential buildings on City Trash accounts. Private haulers may or may not provide recycling to commercial solid waste customers. The City could require any permitted hauler with scheduled pick-ups of commercial garbage to offer recycling services. The DEP recommends such regulations to encourage recycling within municipalities. If 30% of the estimated waste collected by private haulers was recycled (a rate similar to the Somerville community) this would save up to 5,788 tons of eCO2 annually.

Other

Somerville Sustainable Business Certificate

OHCD or the Chamber of Commerce could issue a certification or award to businesses that initiate emissions reductions activities. The criteria could include energy conservation, waste prevention and recycling, provision of environmental preferred products, use of low pollution technology, accessibility for bicycles, or development of employee VMT reduction program. If a business provided evidence that it has met a certain number of criteria they could gain

promotion from the City through window displays, listings on Cities for Climate Protection materials and web space, or other subsidized advertising opportunities.

Municipal

Buildings

Energy Efficient Procurement / Purchase of Environmentally Preferred Products

The US EPA has developed an Energy Star labeling program for energy efficient equipment and appliances. The State's Operations Service Division has established an Environmental Preferred Products program to assist local governments and state agencies to buy energy saving and pollution preventing materials for their offices and programs. Many communities have passed resolutions requiring local government offices to purchase the most efficient and least environmentally harmful products in their

procurement decisions.

Municipal Buildings Energy Efficiency Standards

The City can set minimum standards for the energy efficiency of its own buildings. Fort Collins set a 15% energy reduction goals for all of its city owned buildings. New glass technology can drastically cut energy loss from windows in buildings. Windows that can be opened by occupants can also reduce ventilation system use while improving indoor air quality. In Medford, between 1998 to 1999, City Hall saved nearly 20% on energy bills by converting from oil to gas heat and completing lighting retrofits. This reduced their eCO_2 emissions by 133 tons.

LED Exit Signs

LED lights similar to those used in the City 's new traffic signals could be installed in the “Exit” signs of municipal buildings. Exit signs are found in all public buildings and although they are small the signs are always on. LED lights use 80-90% less energy than standard incandescent lamps. LED lights have no filament and are less likely to fail in an emergency. No data is currently available regarding quantity of electricity currently used by “Exit” signs.

City Purchase of Clean/Green Energy

Deregulation will allow electricity providers to sell electricity that contains a certain percentage of renewable energy production. Although this may be a bit more expensive the bulk purchasing of electricity can bring the electrical cost down and green energy purchases will reduce municipal CO_2 emissions. New regulations will allow local governments to offer residents and businesses the opportunity to join the City in block purchases of green power further reducing the collective cost of renewable energy while investing in new clean energy technologies.

Solar Hot Water and/or PV on Public Buildings

Solar hot water facilities could be added to buildings with heavy summer use and water use. Schools would be best suited for solar photovoltaic panels that contribute to the electrical grid using a high quality inverter, as their peak output would be during the summer vacation months. All City buildings should be evaluated for their daily sun exposure and solar energy potential. The state has created new funds for renewable energy projects that may provide assistance for solar projects on public buildings. Lesley College recently installed PV panels upon a shopping center they own in Cambridge that generates 100 kWh on summer days. Medford has installed solar panels on the roofs of some of their larger public buildings.

Garden Roofs

Many cities are looking at innovative ways to cool down intense summer urban temperatures. Rooftop gardens are one option that serves to reduce urban summer temperatures while also providing aesthetic pleasure, educational opportunities, and acting as a sanctuary for municipal employees and students. The city of Chicago has recently received a great deal of press for installing an urban rooftop garden on its City Hall.

City-Owned Demonstration House

The City of Cambridge, MIT, and Tufts University have all created project houses that demonstrate alternative energy technology. The City could sponsor a renovation of municipally owned property to serve as an outreach center for conservation and renewable energy education for residents or businesses. The City should discuss partnerships with local utilities and/or Boston Oil Consumers Alliance (BOCA) for such a project.

Energy Impact Report on all Plans

Requiring an energy impact report for all new municipal facilities will encourage the city to design energy efficiency into all new buildings and additions ultimately saving the city significant amounts of money in long-term energy costs.

Vehicle Fleet

Downsize Municipal Fleet Vehicles

Downsizing the fleet means reducing unnecessary fleet numbers as well as reducing vehicle size for energy and cost savings. ICLEI estimates that vehicle downsizing from light trucks or sedans to compact cars can result in 2.5 to 6.5 tons of CO_2 reduction per vehicle. More efficient vehicles should be phased in as older vehicles need replacement rather than replacing vehicles before their usable life span is complete.

Alternative Fuel Vehicle Replacement / Conversion of Fleet

The state has mandated that almost all state agencies begin purchasing alternative fuel vehicles in the upcoming years including compressed natural gas (CNG) (used extensively by MassPort), hybrid engines (gasoline and electric), and electric vehicles. The DPW yard and/or the Transfer Station could potentially be CNG fueling station locations. The City may also consider

establishing an alternative vehicle trial program to explore the use of electricity, hybrid, or in the future, fuel cell vehicles. Additionally, large diesel vehicles can be converted to run on compressed natural gas or be used as duel fuel vehicles. If the City 's garbage packers were converted to CNG, they would emit 124 tons of eCO_2 less than their current diesel engines.

Retrofit the Remaining Mercury Streetlights

City-owned lighting in commercial squares is mostly mercury vapor lamps and could be retrofitted to more efficiency high-pressure sodium bulbs. The public's aesthetic concerns over lighting color in squares would have to be addressed prior to any retrofit.

Other

Departmental Accountability

Somerville should consider emphasizing the importance of reducing greenhouse gas emissions to department heads and municipal employees. A simplified regular report by department on their energy use and vehicle fuel use would facilitate regular monitoring of municipal emissions and promote the development of more effective emissions reduction strategies.

Communication with Nearby Communities

Regional groups are forming that are designed to address municipal concerns at the regional level. CLIMB, a group that includes the Metropolitan Area Planning Council, has formed to address the costs that municipalities may face as a result of climate change. MCAN, the MA Climate Action Network, includes several local organizations in the Boston area working together to address local issues. Many of the metro-Boston area communities that have completed inventories are part of MASSCCP and are meeting to discuss ways that they can work together to meet their emissions reduction goals.

Links to More Information:

- **ICLEI- Cities for Climate Protection Program--http://iclei.org/co2/**
- **Tufts Climate Initiative--http://www.tufts.edu/tie/tci/**
- **U.S. EPA Energy Star Program--http://www.energystar.gov/**

  Government/industry partnership that makes it easy for businesses and consumers to save money and reduce energy use through the purchase of energy efficient equipment.
- **EPA Global Warming Site--http://www.epa.gov/globalwarming**

  Science of climate change and the roles of various institutional players. Details impacts of climate change in various areas of the United States. Links to national and state GHG inventories.
- **U.S. Global Change Research Program--http://www.gcrio.org**

  The largest US Government Agency on global environmental change. The basic science of climate change and a host of high-level scientific databases.